



CITY OF BURLINGTON
COMBINED SEWER OVERFLOW UPDATE

DRAFT
December 2012

INTRODUCTION

The City of Burlington, Vermont's largest urban area, is situated in the Champlain Valley on the eastern shores of Lake Champlain. Burlington has a total area of approximately 10.8 square miles and because of its topography is served by three separate wastewater treatment facilities and collection systems. Since Burlington is an older municipality, its collection systems contain varying percentages of combined sewers that convey both domestic sewage and stormwater within the same pipe to these facilities.

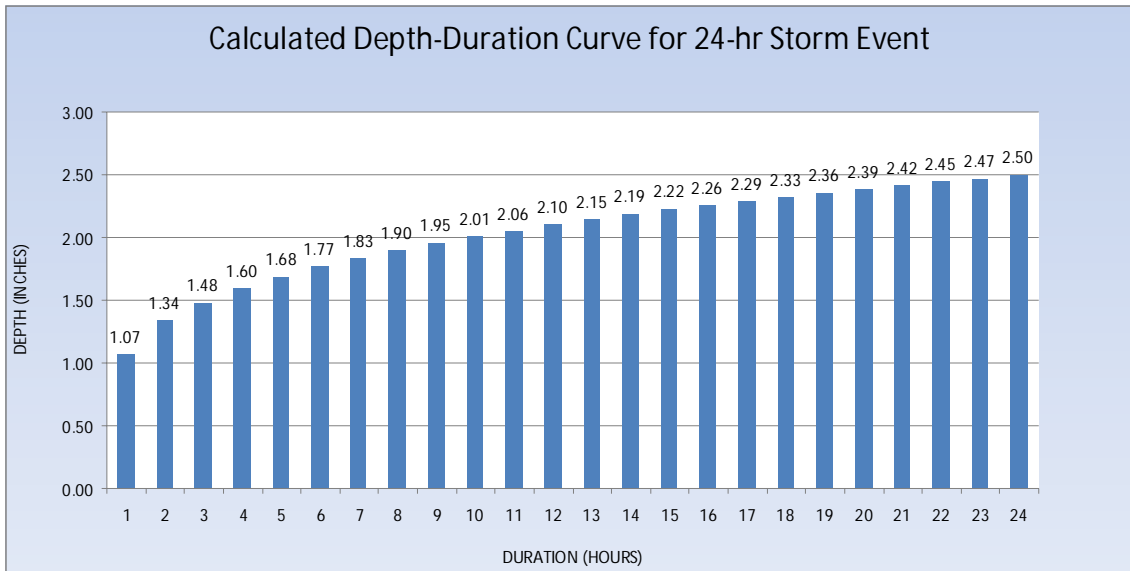
In order to protect public health and prevent damage that can occur from basement and street flooding from combined sewer backups during heavy storms, a number of combined sewer overflow (CSO) manholes were installed in strategic places to provide relief to overloaded combined sewer pipes. Over the last twenty-five years, the City has devoted considerable resources to modify the collection system by separating combined sewers and by upgrading wastewater plants to further treat both sanitary and combined flows. Approximately seven CSO points that discharged directly to waters of the state have now been reduced to four: two on Manhattan Drive (Main WWTP collection system), one on Gazo Avenue (North WWTP collection system) and a more recently discovered one on Colchester Avenue (Riverside WWTP collection system, 2010). All overflows are reported to the State with each plant's monthly NPDES report.

Vermont's CSO policy states that overflows should not exist below the 2.5 inch, 24 hour storm. If they still occur and are allowed by the State, then these discharges shall be required to employ a primary level of treatment for control of solids and floatables, and disinfection shall be required. It is the goal of Burlington to eliminate whenever possible any overflows under the 2.5"/24 hour storm. Separate CSO reports for Manhattan Drive and Gazo Avenue submitted to the State in 2008 indicated that State policy was not being achieved on Manhattan CSOs and was close but somewhat inconclusive for Gazo. Manhole R1.12 at the bottom of Colchester Ave had not yet been discovered as a CSO location.

In 2009 the City filed and received loan funding for CSO reduction projects through the American Recovery and Reinvestment Act (ARRA). This funding was used to remove 2.3 acres of school rooftop connected upstream of Gazo in the North WWTP collection system and approximately 3.5 acres impervious from the combined sewer system upstream of Manhattan Drive in the Main collection system. Appendix B at the end of this document shows details of these projects. The last ARRA project (Bus Barn) was completed in the fall of 2011 so instead of covering all events since 2008 **this report will specifically address CSO reduction progress after ARRA project completion.**

RAINFALL ANALYSIS

It has been generally recognized that rainfall intensity (depth over time) plays as much a role in the volume of surface runoff and corresponding overflows than total depth. One or more inches of rainfall in one hour is significantly different than the same depth over longer periods of time. While Vermont's 1990 CSO policy only mentions total 24 hour rainfall depth, later documents released by the State mentioned a peak hour intensity of 1.07 inches. This was determined to be derived from the SCS (Soil Conservation Service) Type II synthetic rainfall distribution developed by Hershfield (1961) and Frederick et al. (1977). This synthetic distribution is widely used when there is a lack of actual rainfall data. In 2008 we had proposed a different hourly intensity and depth-duration curve using real precipitation data from the National Weather Service office at the Burlington International Airport, however this data was deemed to be unacceptable in various conversations with State representatives. So, using the SCS Type II distribution, the 2.5"/24 hr Depth-Duration Curve looks like this:



This curve is a simple attempt in evaluating storm events since every storm is different in duration and intensities. This curve should be used as follows: if an actual storm lasts, for example, three (3) hours and had a recorded rainfall depth greater than the curve's 3 hr/1.48" depth, that storm was greater than a 2.5"/24 hr storm event. In the future we should look at curves with time intervals shorter than one hour to address flash storms that dump water in minutes.

A rain gauge at Main WWTP located approximately one mile from Manhattan Drive is used to measure rainfall for those CSO points. It's important to note that at this time our SCADA system only records hourly rainfall. The rain gauge at Gazo timestamps rainfall in 0.01" increments and will be reviewed for that location. East WWTP only has a rain tube that they read and dump out on a daily basis. Rainfall data summarized in the table below is provided in Appendix C.

2012 OVERFLOW TABLE

DATE	RAINFALL (total/hrs, peak intensity)	(a) CSO MINS MANHATTAN @ PARK	(b) CSO MINS MANHATTAN @ N. CHAMP.	(c) CSO MINS GAZO AVE	(d) CSO MINS COLCHESTER AVE	CSO COM- PLIANT
7/4/12	1.11"/1	41	21	0	54	Y, note 1
7/17/12	0.68"/12, 0.51"	29	0	0	23	N - a,d
7/23/12	0.83"/7, 0.35"	0	0	0	12	N - d
8/5/12	0.30"/2, 0.29"	0	0	0	7	N - d
8/10/12	0.61"/7, 0.45"	16	0	0	5	N - a,d
8/11/12	0.96"/2, 0.91"	34	0	27, note 2	28	N - a,d
9/4-9/5	3.33"/7, 1.15"	51	0	0	140	Y, note 1
9/8/12	0.32"/3, 0.29"	0	0	0	10	N - d

NOTES:

1. July 4 and September 4/5 storms are deemed compliant since these storm's depths or intensities exceeded the 2.5"/24 hr SCS Type II event.
2. Gazo overflowed on August 11 due to reduced soil infiltrative capacity from two prior days of rainfall (0.87" on 8/10 and 0.14" on 8/9). It did not overflow during the two storms exceeding State requirements. The preceding wet weather also applies for Manhattan system.
3. There were no other storms this year that were close to the 2.5"/24 hr event and no overflows occurred.

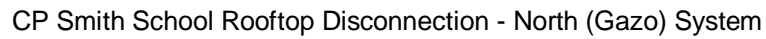
REPORT SUMMARY

- Based upon the above data and explanation of its only overflow, we believe that Gazo is in compliance with State CSO policy.
- Progress has been made in the Main collection system such that the Manhattan/N. Champlain CSO is now in compliance. More work needs to be done at the Manhattan/Park overflow. Options include more impervious disconnection (rooftop, driveway, street), more stormwater retention/detention, and potentially even looking at a larger connecting pipe between N. Champlain and Park CSOs.
- The Colchester Ave overflow point needs further evaluation. It is possible the recorded overflows are actually backwater surcharges from the downstream pipe on Riverside Avenue.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "S. Roy", with a stylized flourish at the end.

Steve Roy, P.E.
Project Engineer
Burlington Public Works

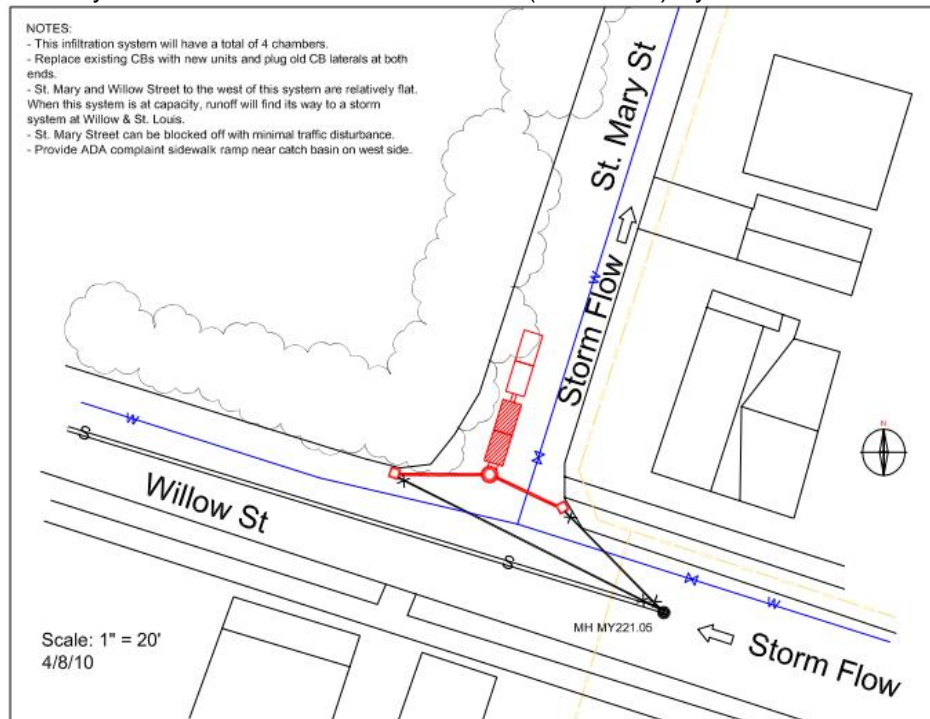


NOTES:

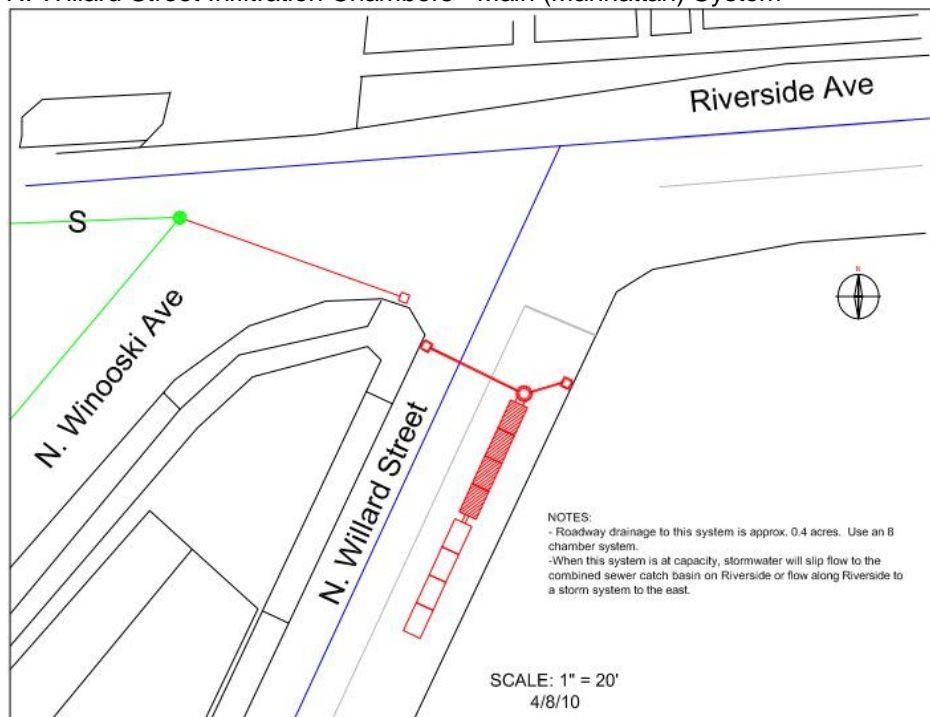
- Roadway drainage to this system is approx. 9000 sqft (0.2 acres). Use an 6 chamber system.
- Replace existing CBs with new units, and plug old CB laterals at both ends. Reconnect 6" PVC pipe on north basin.
- When this system is at capacity, stormwater will flow down St Louis to a storm system at Manhattan Drive.
- Luck Street can be blocked off with minimum traffic disturbance.

Scale: 1" = 20'
4/5/10

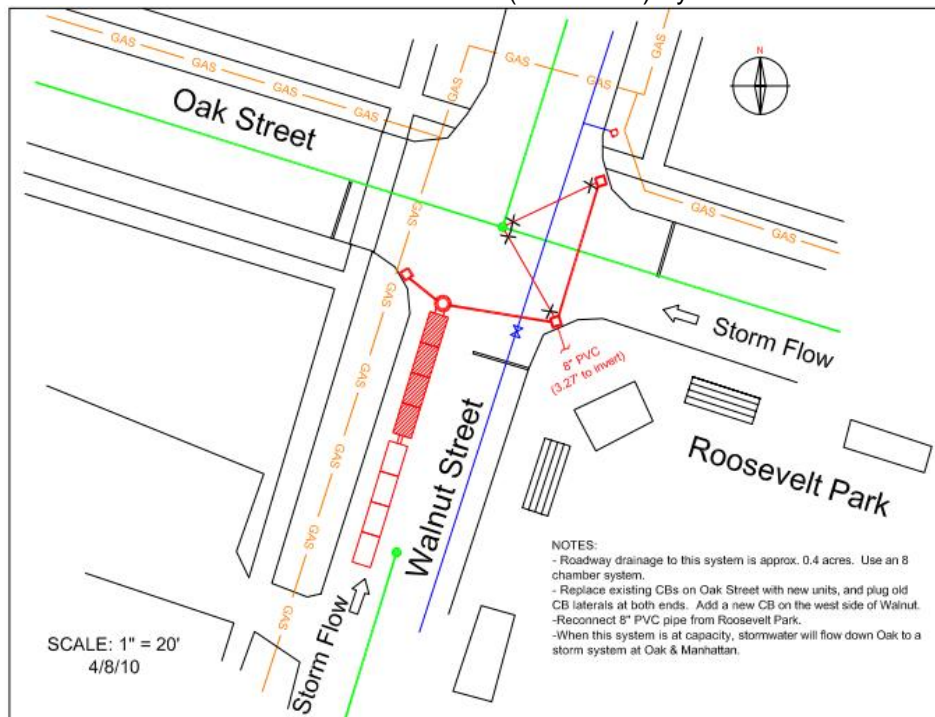
St. Mary Street Infiltration Chambers - Main (Manhattan) System



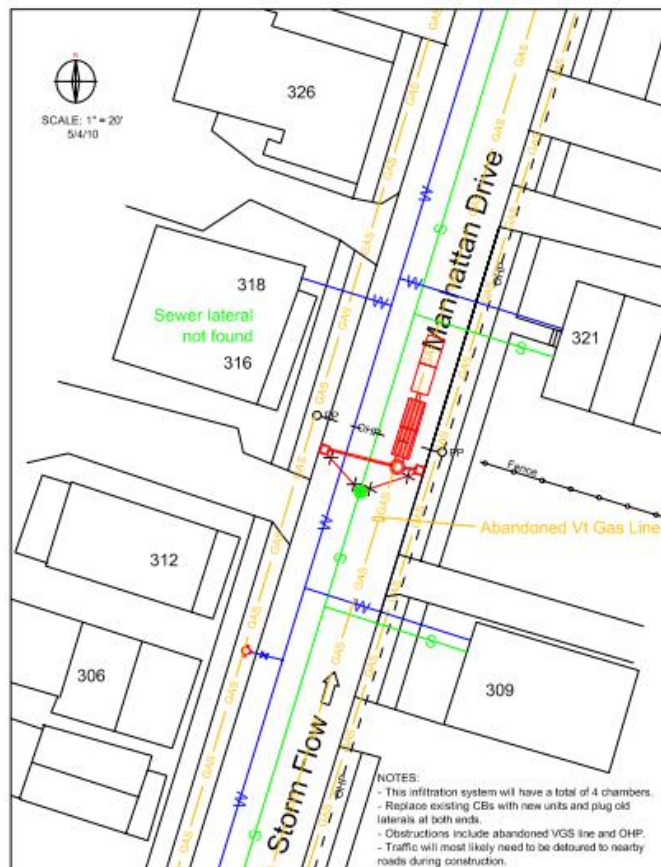
N. Willard Street Infiltration Chambers - Main (Manhattan) System



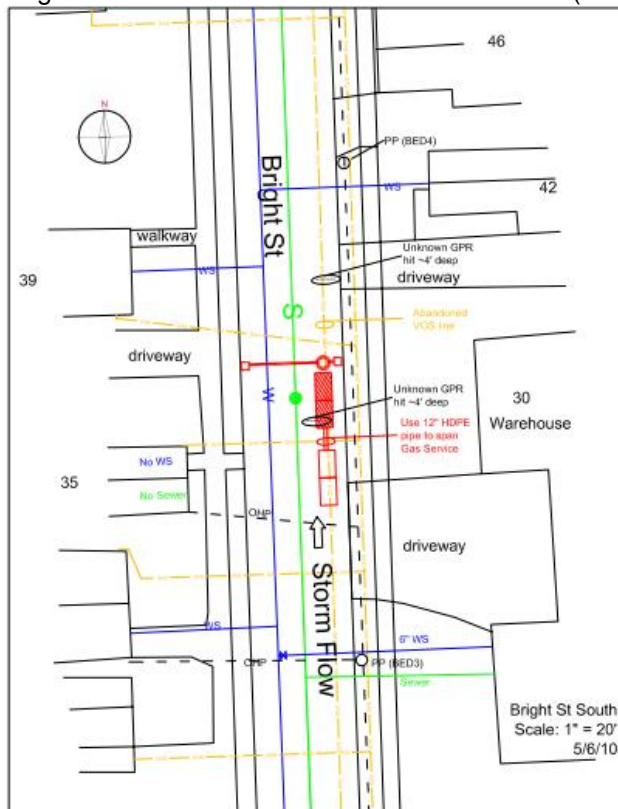
Walnut Street Infiltration Chambers - Main (Manhattan) System



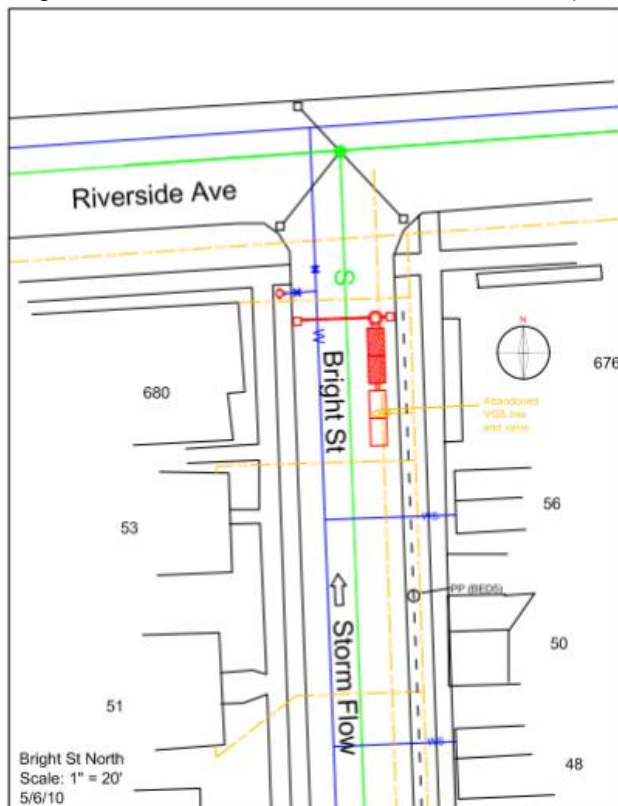
Manhattan Drive Infiltration Chambers - Main (Manhattan) System



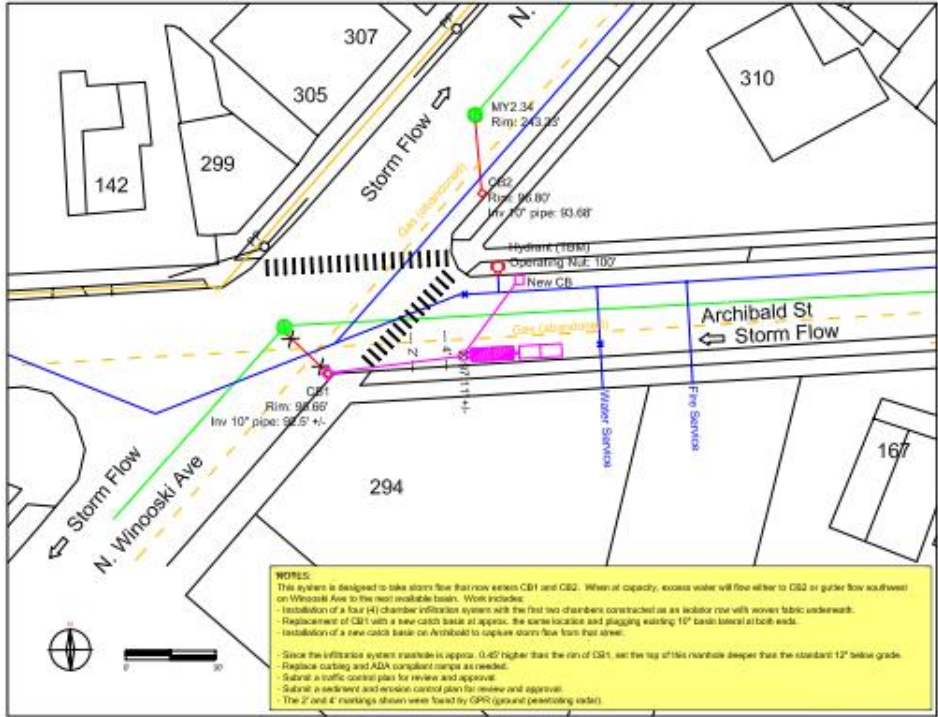
Bright Street South Infiltration Chambers - Main (Manhattan) System



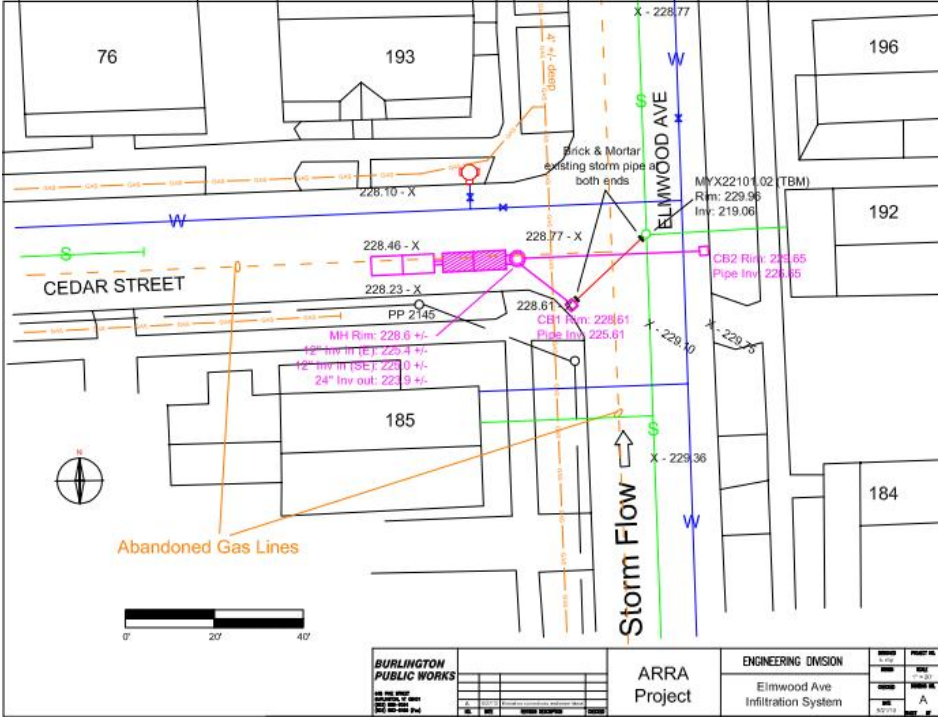
Bright Street North Infiltration Chambers - Main (Manhattan) System



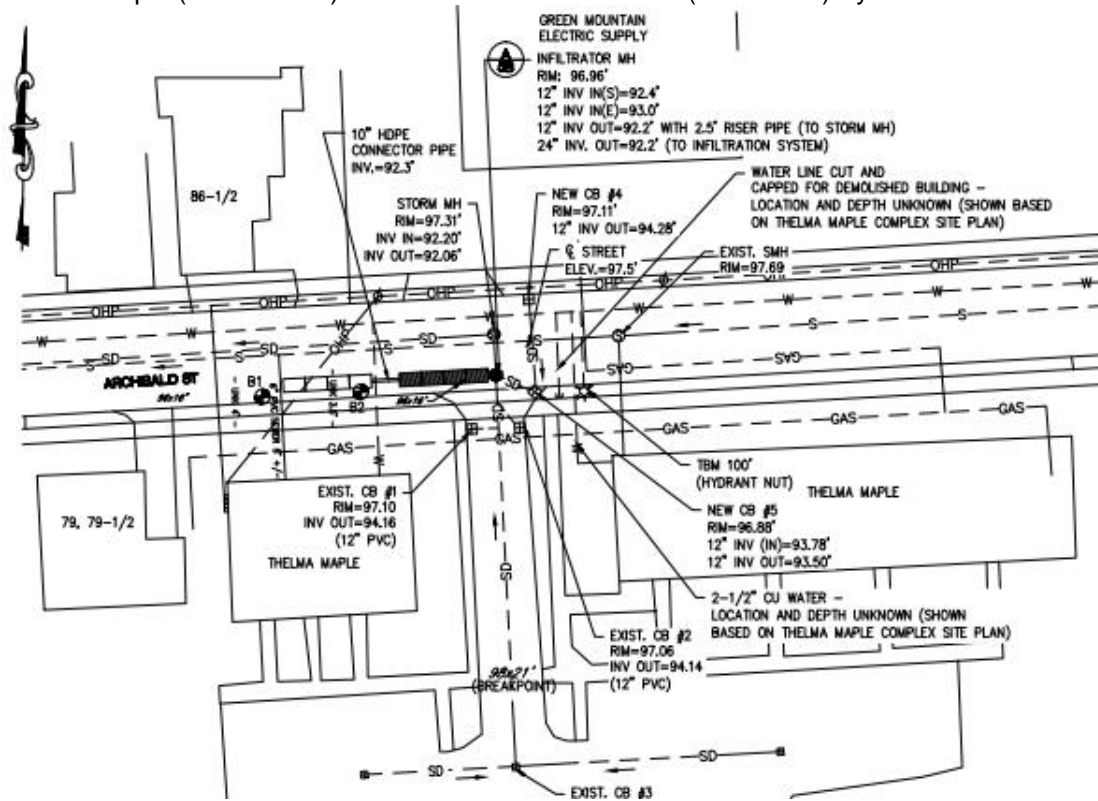
Archibald/N. Winooski Infiltration Chambers - Main (Manhattan) System



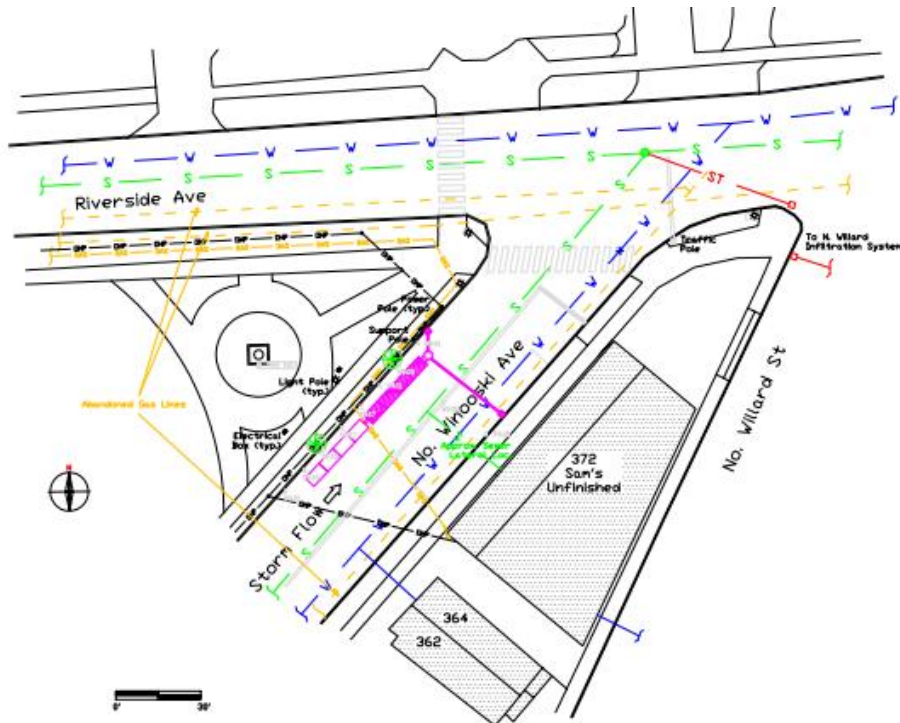
Cedar/Elmwood Infiltration Chambers - Main (Manhattan) System



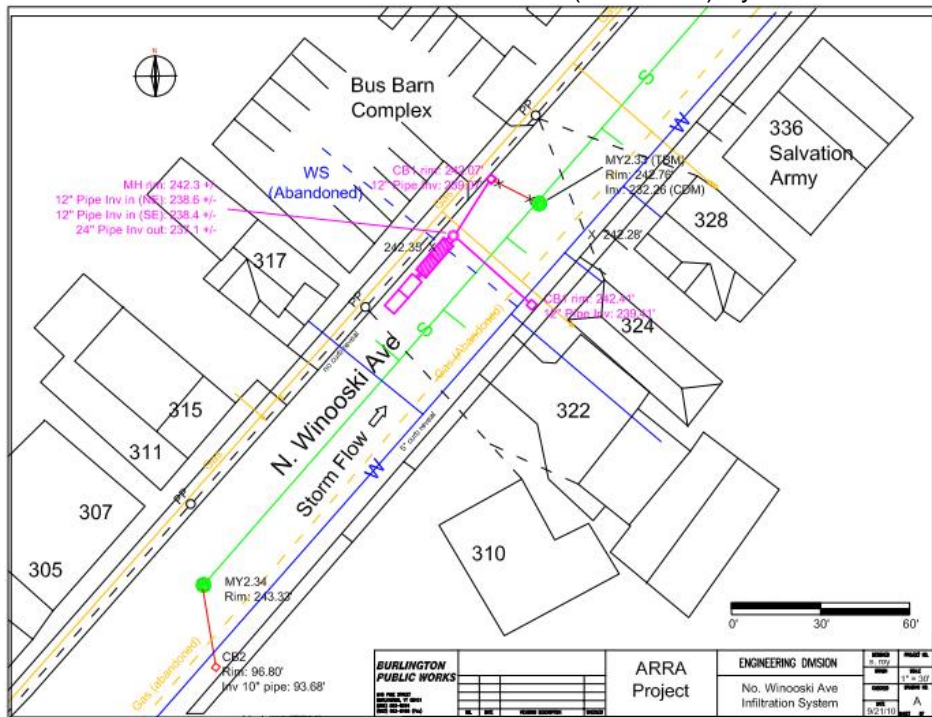
Thelma Maple (Archibald St) Infiltration Chambers – Main (Manhattan) System



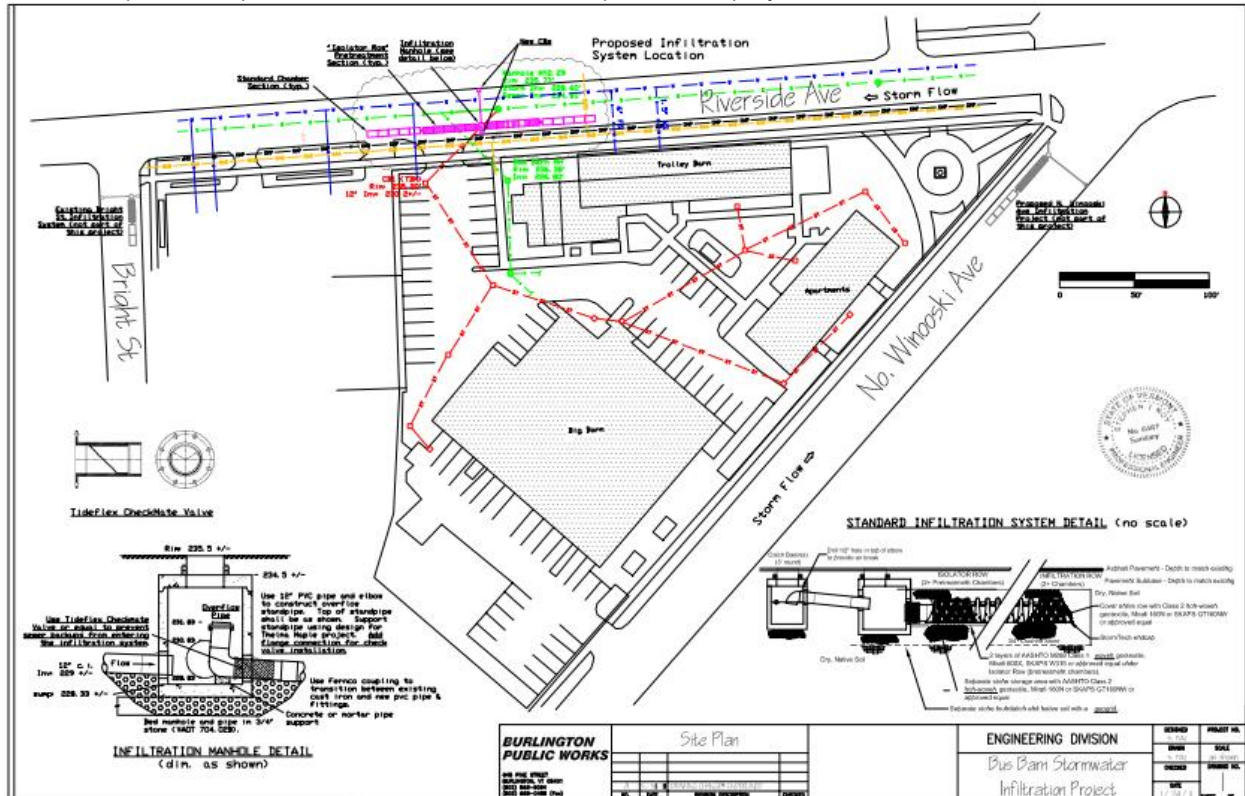
N. Winooski North Infiltration Chambers – Main (Manhattan) System



N. Winooski South Infiltration Chambers – Main (Manhattan) System



Bus Barn (Riverside) Infiltration Chambers – Main (Manhattan) System



MISCELLANEOUS PHOTOS

CP Smith Storage Pipe



CP Smith Connection to James Ave



LC Hunt Storage Tanks



LC Hunt Connection to Storm System



HO Wheeler Pervious Concrete Paving

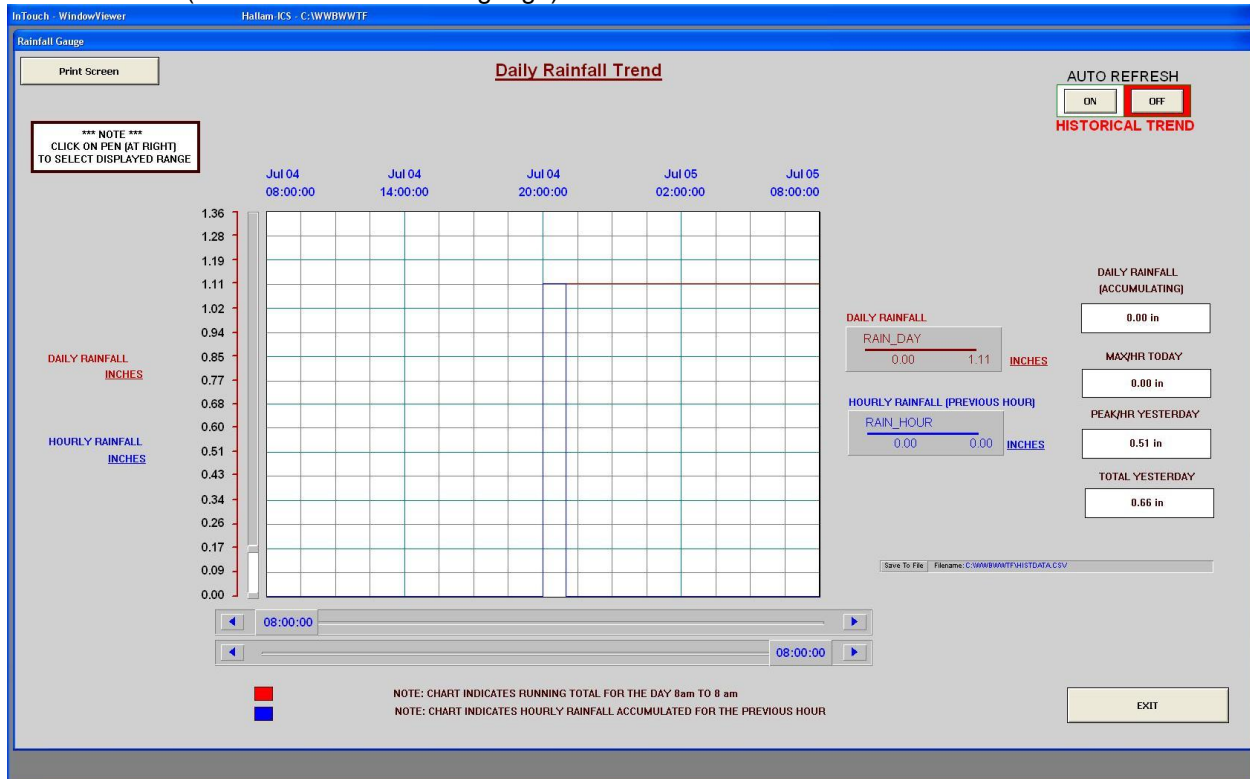


Typical Infiltration Chamber Installation

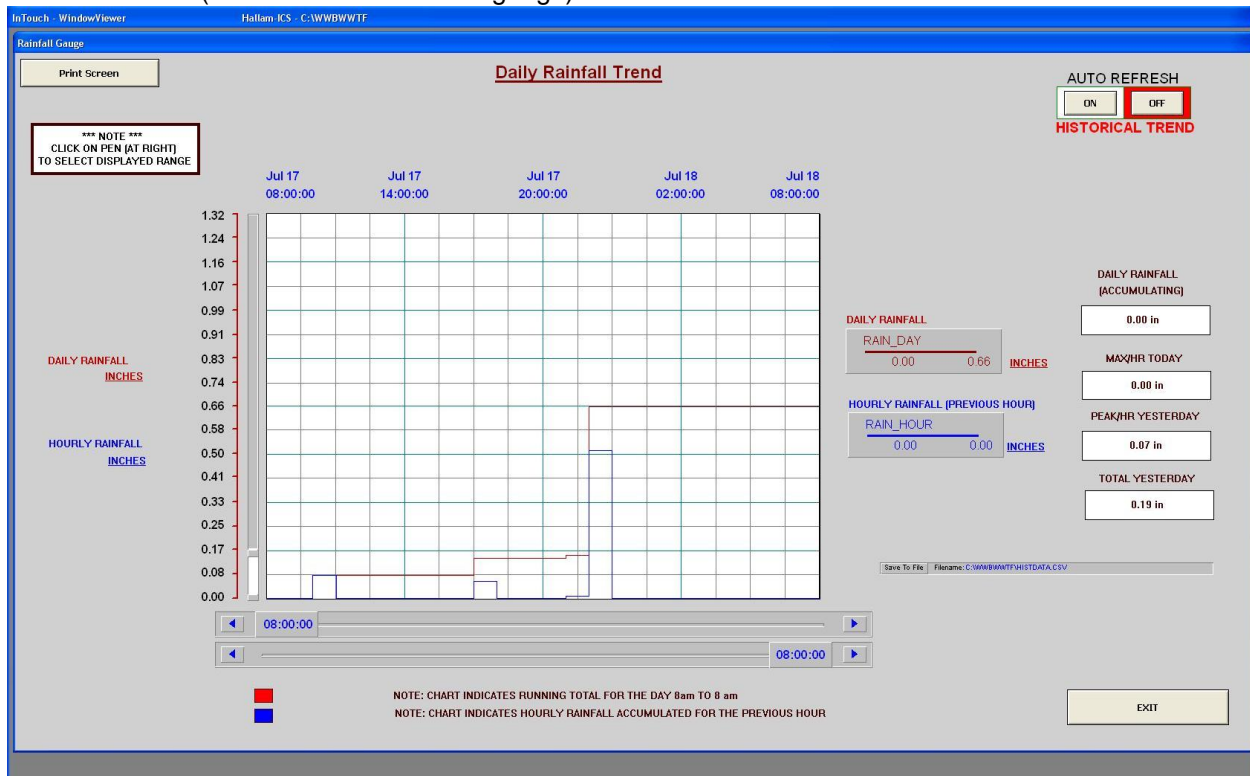


APPENDIX B – RAINFALL DATA

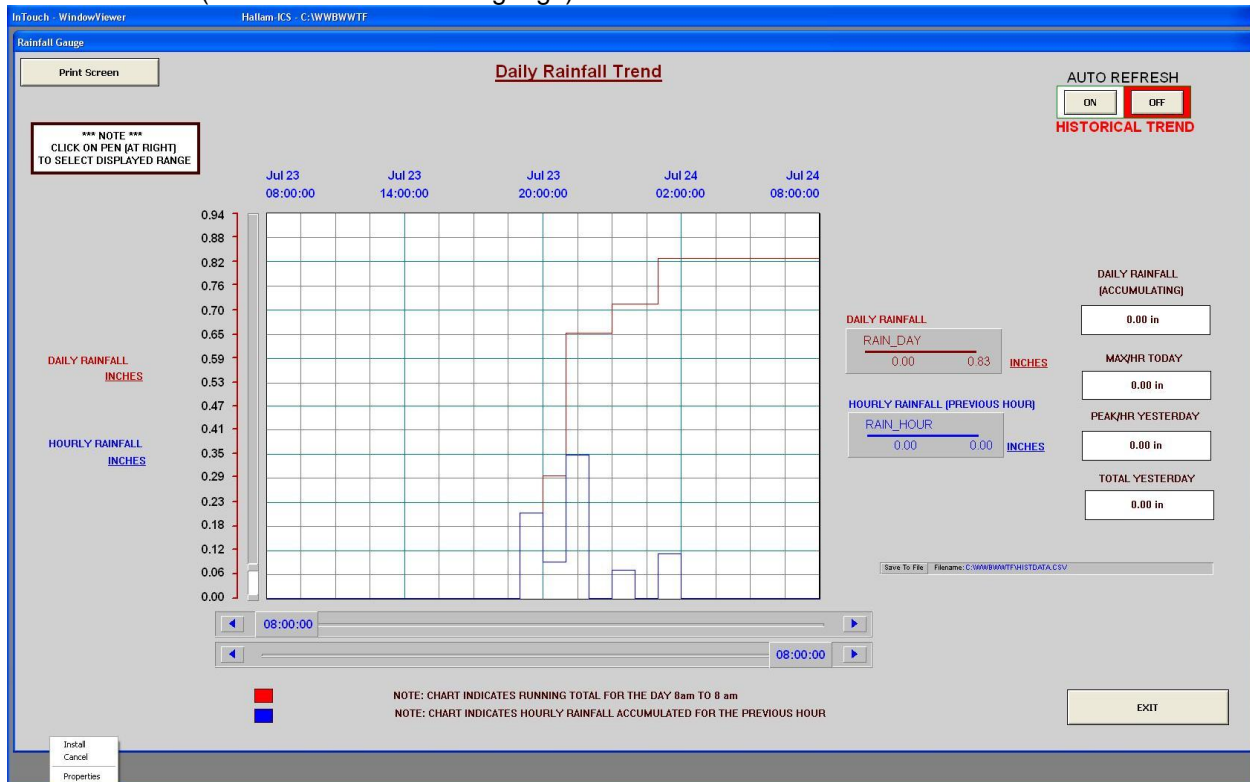
7/4/12 Rainfall (source: Main Plant Raingauge)



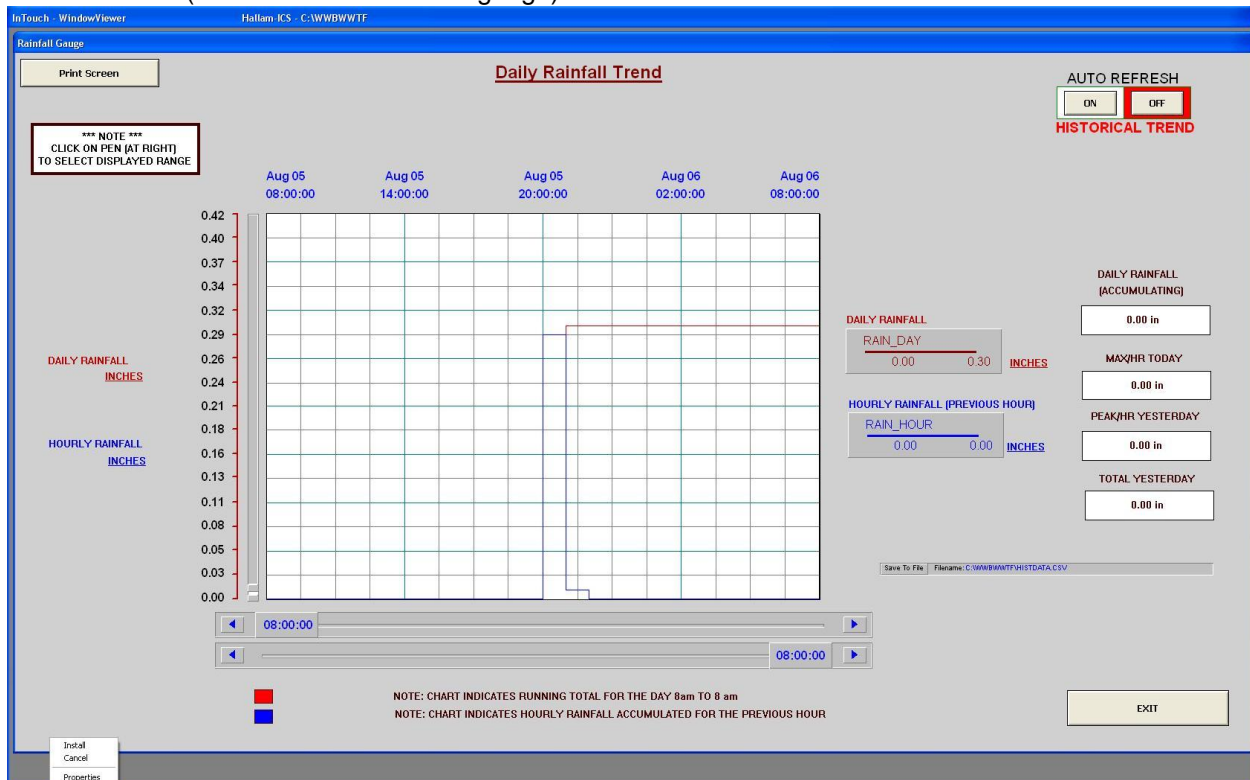
7/17/12 Rainfall (source: Main Plant Raingauge)



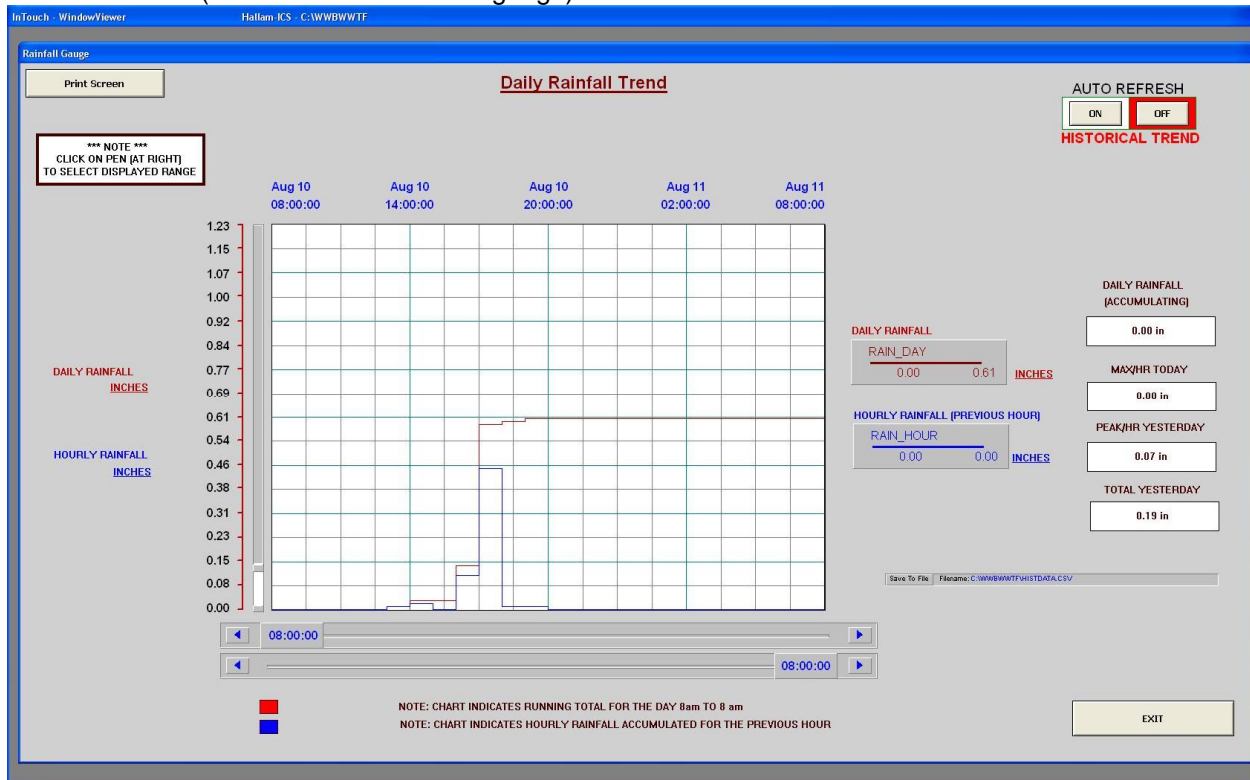
7/23/12 Rainfall (source: Main Plant Raingauge)



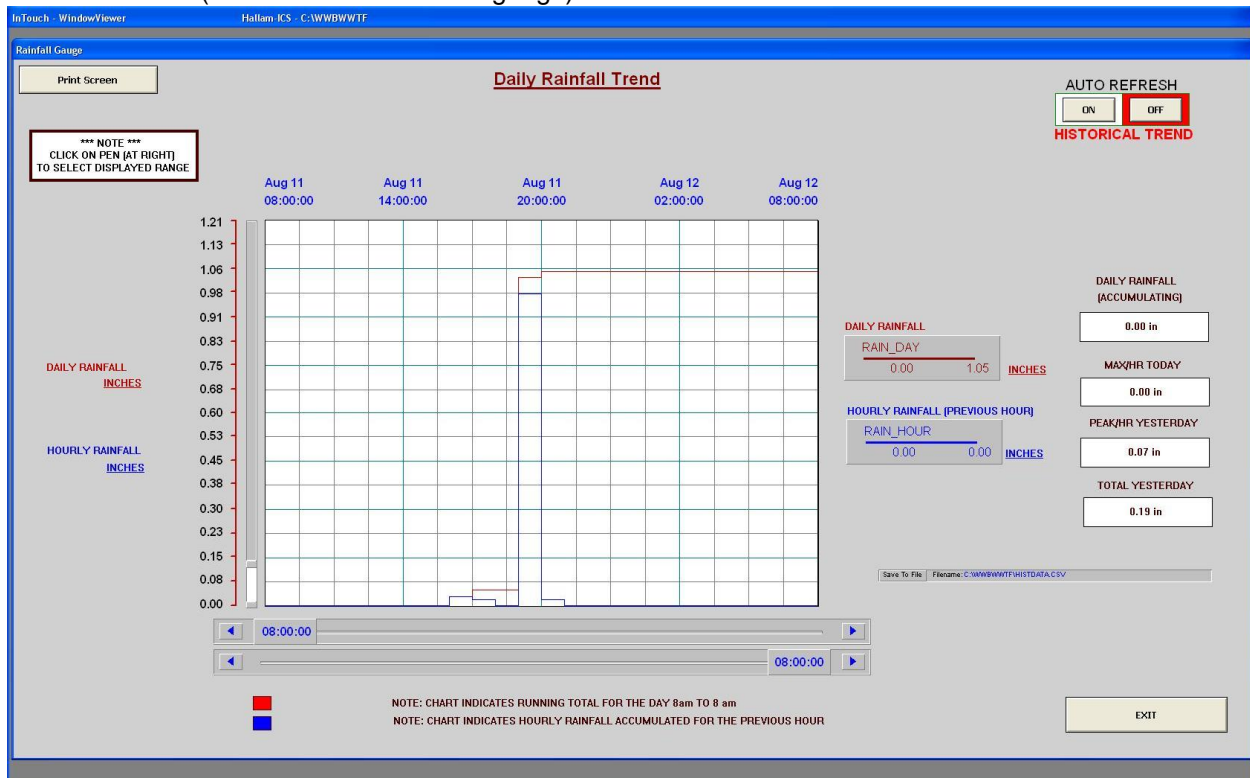
8/5/12 Rainfall (source: Main Plant Raingauge)



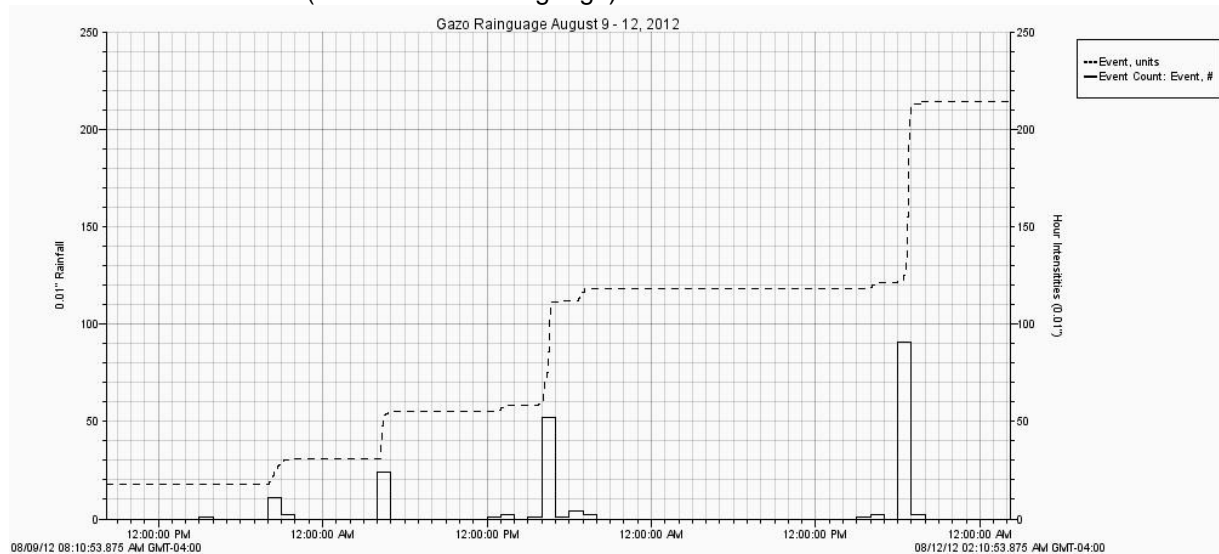
8/10/12 Rainfall (source: Main Plant Raingauge)



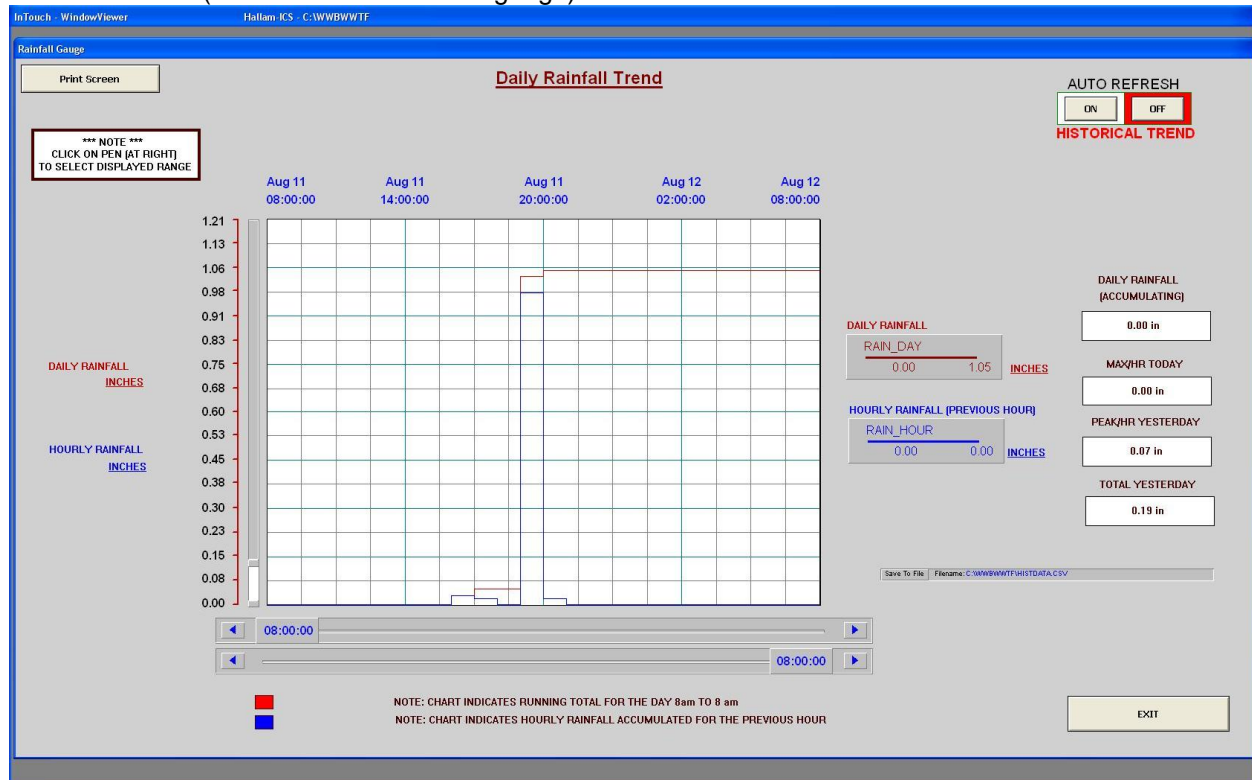
8/11/12 Rainfall (source: Main Plant Raingauge)



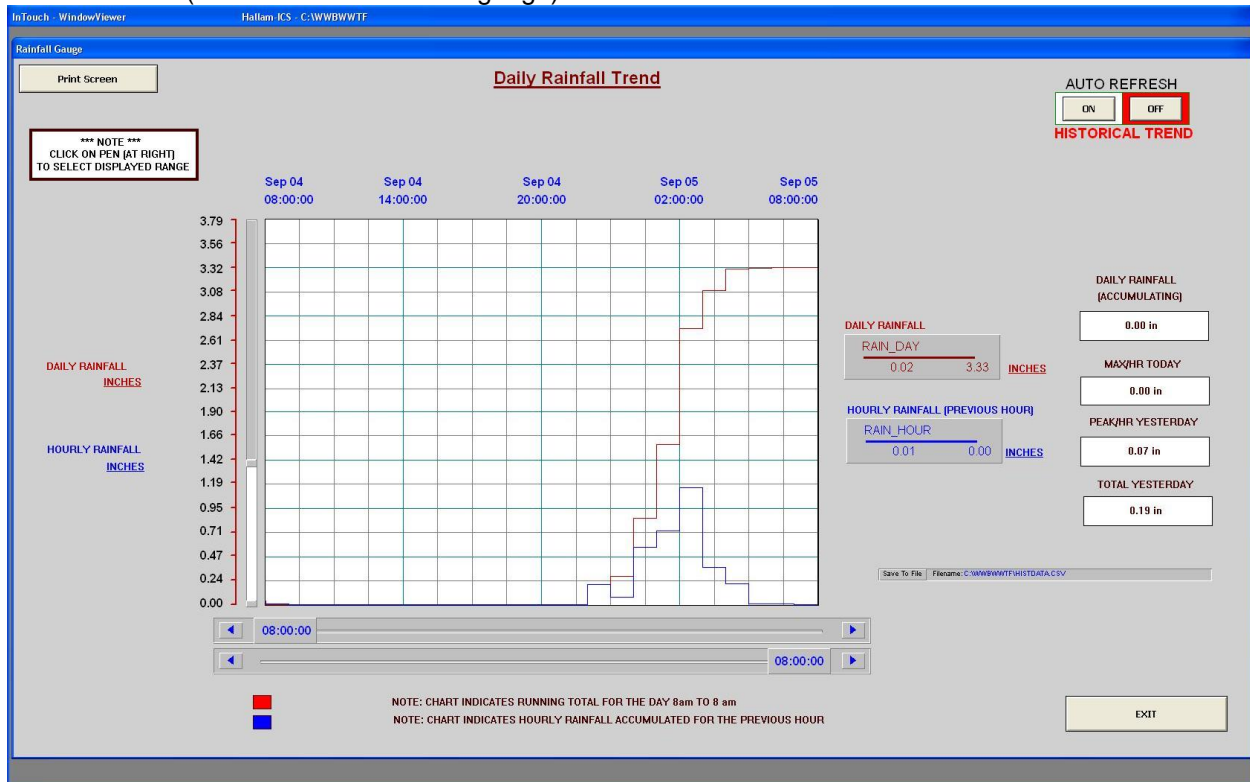
8/9/12 – 8/12/12 Rainfall (source: Gazo Raingauge)



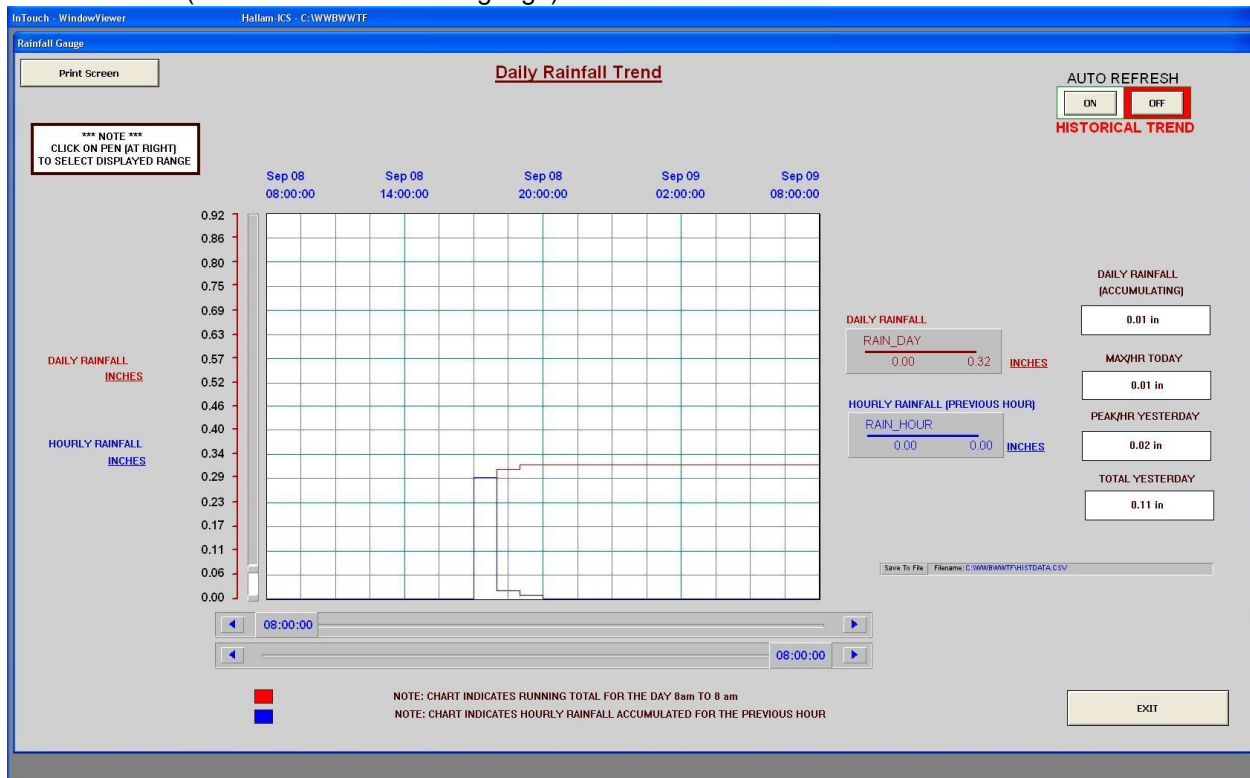
8/11/12 Rainfall (source: Main Plant Raingauge)



9/4/12 Rainfall (source: Main Plant Raingauge)



9/8/12 Rainfall (source: Main Plant Raingauge)



- END OF DOCUMENT -